

WHAT IS CLAIMED IS:

1 1. A video display apparatus for directing light forming a video image in an X, Y, Z coordinate system wherein the X and Y axis form the XY plane that contains the cross section of the dispersed light pattern, and the Z axis is in the direction of the propagation of light and is through the center of the light pattern in the XY plane, comprising:

5 a. a housing;

 b. a plurality of pixels mounted in the housing for generation of pixels of light to make up the video image to be viewed by an observer or observers, each pixel representing the smallest increment of the image, each pixel comprising a plurality of light emitting diodes and each light emitting diode arranged to emit light
10 outwardly from the housing; and

 c. a diffractive optical element mounted on the housing in front of each pixel, the diffractive optical element being arranged to receive the light emitted by the pixels and disperse the light in a substantially elliptical pattern directly to an observer(s) without using any light emitted modulating guide such that the dispersed
15 light is centered along the Z axis and the pattern is greater along the X axis than along the Y axis.

1 2. The video display apparatus of Claim 1 wherein the housing defines a planar surface, the LEDs being arranged substantially in a plane parallel to the housing surface with the Z axis being perpendicular to the housing surface.

1 3. The video display apparatus of Claim 1 further comprising a mask, the mask securedly fixed to the housing such that the diffractive optical element is between the housing and the mask, the mask surrounding the light emission area of each pixel to reduce reflected light.

1 4. The video display apparatus of Claim 1 wherein the housing defines a substantially planer surface and wherein the diffractive optical element redirects the light incident from the LEDs such that the redirected light is at an angle which is at least 3 degrees greater than the incident light with respect to the Z axis.

1 5. The video display apparatus of Claim 1 wherein the housing defines a substantially planar surface and further comprising a reflector for each light emitting diode for directing additional light in substantially an outward direction perpendicular to the surface of the housing.

1 6. The video display apparatus of Claim 1 wherein each pixel has at least one light emitting diode for emitting green light, at least one light emitting diode for emitting blue light and at least one light emitting diode for emitting red light.

1 7. The video display apparatus of Claim 1 wherein a plurality of video image modules can be combined to form a video image board.

1 8. The video display apparatus of Claim 1 wherein the diffractive optical element is selected from the group having holographic, kinoform, binary multilayer and continuous (grey scale) faces which rely on diffraction to control the transmitted wavefront.

1 9. The video display apparatus of Claim 1 wherein the diffractive optical element can be interchanged with other diffractive optical elements providing a variety of forms of transmitted light.

1 10. The video display apparatus of Claim 1 wherein the diffractive optical element acts as a diffuser.

1 11. The video display apparatus of Claim 1 wherein the diffractive optical element acts as
a homogenizer.

1 12. The video display apparatus of Claim 1 wherein the diffractive optical element is a
surface relief holograph.

1 13. The video display apparatus of Claim 1 wherein the diffractive optical element is a
kinoform element.

1 14. The video display apparatus of Claim 1 wherein the diffractive optical element is a
binary element.

1 15. The video display apparatus of Claim 1 wherein the diffractive optical element is a
multilayer element.

1 16. The video display apparatus of Claim 1 wherein the diffractive optical element is a
continuous (grey scale) element.

1 17. A method for characterizing the light output of a video display apparatus having a
plurality of pixels, each pixel comprising at least one LED for each color with each pixel
representing the smallest increment of the image to be viewed by the observer and a diffractive
optical element mounted in front of the pixels to disperse the light in a substantially elliptical pattern
5 directly to an observer(s) without using any light emitted modulating guide comprising:

 a. supplying power at a selected level individually to the LED or LEDs
for each color in each pixel; and

 b. measuring the intensity of the light generated by each LED or LEDs
for each color in each pixel.

1 18. The method of Claim 17 further including the step of controlling the power supplied to
the LED or LEDs responsible for each color in each pixel to normalize the light output from the
display apparatus.

1 19. The method of Claim 18 wherein the step of supplying power to the individual LED or
LEDs responsible for each color in each pixel comprises supplying current at a predetermined level
for a selected time.

1 20. The method of Claim 19 further including the step of controlling the time that current
at said predetermined level is supplied to the LED or LEDs responsive for each color in each pixel
to normalize the light out put from the display apparatus.

1 21. The method for characterizing the output of a video display apparatus by regulating the
intensity of each color of Claim 17 further comprising the steps of:

 a. determining if the intensity of any color specific LED or LEDs in any
pixel is below an acceptable level; and

5 b. removing the video display apparatus and replacing the unacceptable
LED or LEDs when any color emitted is below an acceptable level.

1 22. A video display apparatus, the display to be viewed by one or more observers,
comprising:

 a. a group of light emitting diodes making up individual pixels, each
pixel emitting light in substantially an outward direction towards the observer(s); and

5 b. a diffractive optical element adapted to receive the light emitted by
each pixel and transmitting the light in a substantially elliptical pattern directly to an
observer(s) without using any light emitted modulating guide.

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23. The video display apparatus of Claim 1 wherein the horizontal spread is between about plus 50 degrees and minus 50 degrees and the vertical spread is between about plus 7 degrees to plus 25 degrees and between about minus 7 degrees to minus 25 degrees.